Technical Memorandum

Fisheries and Aquatic Biota

For

Blue Water Bridge Plaza Study
St. Clair County, Michigan

MDOT Contract No. 2002-0512
JN 57779

Prepared by:

Wetland and Coastal Resources

Prepared for:
Wilbur Smith Associates, Inc.
and
Michigan Department of Transportation

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SUMMARY

The biotic communities and habitats associated with the Stocks Creek and the Black River include valued aquatic resources with habitats for cold, cool, and warm water fish. The Black River is managed by the Michigan Department of Natural Resources for trout and salmon within the project area, and Stocks Creek is a warm water tributary to the Black River.

To determine the quality of the watercourses and to assess potential impacts from the Blue Water Bridge Plaza Study (Alternatives 1, 2, and 3), two stations along Stocks Creek and portions of the Black River were sampled. Great Lakes Environmental Assessment Section (GLEAS), Procedure # 51, was used to sample and assess the quality of habitat, the quality of the macroinvertebrate community, and the quality of the fish community on Stocks Creek. The benthic community of the Black River was also sampled within areas of potential impact.

Results of the Stocks Creek study found the quality of habitat to be good to excellent and the quality of the macroinvertebrate community structure to be poor. Fish communities were not sampled extensively, but survey data suggest that Stocks Creek has a poor fish community rating. However some species collected are indicative of higher quality streams and habitat is present to support additional species that are typical of a healthy fish community structure.

Alternatives 1 and 2 avoid impacts to Stocks Creek but may require impacts to the Black River through bridge construction and placement of bridge supports. Alternative 3 has the potential to impact Stocks Creek and the Black River through enclosure of the stream and placement of bridge supports, respectively. Based on the survey data and known quality of the watercourses, negative impacts to the streams can be minimized by utilizing appropriate design and construction techniques to protect water quality and comply with MDOT's Phase II Stormwater Permit.

Enclosing Stock Creek has the potential to cause the most significant resource impacts. Stream enclosures proposed under Alternative 3 would essentially eliminate habitat and much of the aquatic biota present. Alternatives identified to minimize impacts, if avoidance is not feasible or prudent, include using a clear span bridge, bottomless box culvert, or oversized culvert buried beneath the existing streambed.

Results of surveys on the Black River show poor water quality conditions with degraded habitats. However, placement of bridge supports in the river will result in minor negative impacts to production of macroinvertebrates that are food for fish.

Additional recommendations were made to minimize stream impacts, should road construction at these locations be necessary. Final side slopes and erosion protection plans should be designed to prohibit sediment from entering the stream both during and after construction. In addition, all disturbed stream bank and bed areas should be restored with appropriate vegetation and substrates for use by aquatic biota.

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1.0 INTRODUCTION

Three alternatives for expansion of the Blue Water Bridge Plaza are currently under review by the Michigan Department of Transportation (MDOT) and contracted consulting groups. As part of the alternative review process, potential impacts to streams located within the project area are being assessed.

The Black River and Stocks Creek are located within the area of all three expansion alternatives. The Black River is managed by the Michigan Department of Natural Resources (MDNR), Fisheries Division for trout and salmon and both watercourses contain habitat for warm, cool and cold water fish. Additionally, the State Endangered round hickorynut mussel (*Obovaria ubrotunda*), although never found in the Black River, has been reported to exist in St. Clair County and the Lake St. Clair drainage area.

On August 22, 2002, Wilbur Smith Associates, Inc. (WSA) authorized Wetland and Coastal Resources, Inc. (WCR) to conduct assessments of the habitat and macroinvertebrate communities of Stocks Creek and the Black River. The habitat and biotic communities of both streams were sampled to gather data for impact assessments associated with the three alternatives. Data were collected on September 24, 2003, June 18, 2004, and July 9, 2004.

Sampling of the fish communities was limited to incidental catch during macroinvertebrate surveys. Therefore, analysis of the fish community was based on available habitat and known fish use identified by the MDNR, Fisheries Division.

Sampling protocol and data analysis programs designed and approved by State and Federal agencies were used to complete the assessments. The results of the analysis will be useful as baseline information for assessing potential impacts and for future monitoring efforts.

The information provided within this report represents the opinions and best professional judgment of WCR. State and Federal regulatory agencies have the final decision with regards to impact assessments and permitting issues.

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2.0 METHODS

2.1 Stocks Creek

The methods used to assess the biological integrity of Stocks Creek are those set forth in Great Lakes and Environmental Assessment Section (GLEAS) Procedure #51, *Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers (1997),* with 2002 revisions. Procedure 51 is accepted by both Federal and State agencies as an accurate, consistent and repeatable sampling and analytical protocol for Michigan streams.

The biosurvey protocols detail evaluation of the macroinvertebrate community, the fish community, and habitat quality. The results are used as indicators of water quality and biological integrity. Analysis is made according to a set of selected metrics (measurements) that are made in the field.

Prior to selecting sample locations, the MDNR Fisheries Division and MDEQ Water Bureau were contacted for information on past fish and macroinvertebrate sampling locations and results. Such information could assist in assessing the quality of the creek and provide data for comparison between years. However, based on our discussions neither agency has sampled Stocks Creek for fish or macroinvertebrates.

2.1.1 Site Selection

Sampling locations were limited to two (2) areas of potential impact from Alternative 3. Two sampling stations were selected on Stocks Creek: one downstream and one upstream of I-94 (**Figure 2.1 Attachment A-1** of **Appendix A**). Both stations are located within the lower portion of the Stocks Creek watershed near its confluence with the Black River. Photographs of each station may be found in **Appendix B**.

Sampling locations were selected to avoid direct influence of I-94, potential influences from I-94 culverts, and to include a representative sample of stream and bank habitat types. Two 100-foot stream sections were identified at Station 1 and Station 2, beginning approximately 150 feet upstream and 150 feet downstream of I-94, respectively. Station 2 was sampled first to avoid bias of metrics through downstream drift of invertebrates.

2.1.2 Habitat

The physical characteristics of the stream and stream banks were recorded for each station. A total of 11 metrics were scored based on GLEAS Procedure #51 rating tables for pool/glide streams (**Table 2.1**, **Attachment C-1** of **Attachment C**). These metrics are separated into three general categories as identified below:

- Substrate and In-Stream Cover
  - *Epifaunal Substrate/Available Cover*
  - *Pool Substrate Characterization*
  - *Pool Variability*

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- Channel Morphology
  - *Sediment Deposition*
  - *Flow Status – Maintained Flow Volume*
  - *Flow Status – Flashiness*
  - *Channel Alteration*
  - *Channel Sinuosity*
- Riparian and Bank Structure
  - *Bank Stability*
  - *Bank Vegetative Protection*
  - *Riparian Vegetation Zone Width*

Scoring for each metric was based on visual observation and best professional judgment.

2.1.3 Aquatic Macroinvertebrates

Dip nets with 1 mm mesh were used to sample aquatic macroinvertebrates. Sampling was conducted in an upstream direction and each station was sampled until no new taxa were found (20 minutes for each station). All available habitats were sampled, including fast and slow moving water areas, hard and soft substrates, vegetated areas, woody material and undercut banks. Kick sampling was used in most areas, except in slower moving water, where dip-netting methods were used. Large stones and logs were sampled by hand. All organisms collected were identified, counted, and recorded. Merritt and Cummings (1996) was used for identification of aquatic insects.

The GLEAS Procedure #51 program was used to calculate the following nine (9) metrics for each station, to provide a qualitative rating of the macroinvertebrate community:

- *Total Number of Taxa*
- *Total Number of Mayfly Taxa*
- *Total Number of Caddisfly Taxa*
- *Total Number of Stonefly Taxa*
- *Percent Mayfly Composition*
- *Percent Caddisfly Composition*
- *Percent Contribution of Dominant Taxon*
- *Percent Isopods, Snails, and Leeches*
- *Percent Surface Dependant*

2.1.4 Fisheries

Fisheries sampling was limited to incidental catch from hand seining during macroinvertebrate sampling. Sampling with electrofishing equipment was not conducted. The fish collected were counted, identified and sorted by taxa according to GLEAS Procedure #51, to provide general information as to the fish present at the sample locations and their tolerance to environmental conditions. However, use of these data is limited and the results do not necessarily represent the fish community at large.

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Scott and Crossman (1979) was used to identify fish and to review habitat requirements of each species.

2.2 Black River

The methods used to assess the biological integrity and habitat of the Black River included benthic invertebrate assessments and substrate characterization. Benthic invertebrates and substrates were conducted using grab samples within the project area to characterize the existing benthic animal community and river bottom habitats.

The MDNR Fisheries Division and MDEQ Water Bureau were also contacted for information on past fish and macroinvertebrate sampling for the Black River. While some sampling was conducted on the river, the sampling was located within the upper portions of the watershed and results are not appropriate for comparison of the downstream portion of the river within the project area.

2.2.1 Site Selection

All three expansion alternatives include construction of additional lanes and bridges over the Black River at I-94. Therefore, sampling on the Black River was limited to the general vicinity of the I-94 crossing, located within the lower portion of the Black River watershed. **Figure 2.2** (**Attachment A-2** of **Appendix A**) identifies the sampling locations on the Black River, and photographs of the study area may be found in **Appendix B**. **Figure 2.3 (Attachment A-3** of **Appendix A)** shows the sample locations for the Black River and Stocks Creek in relations to their watersheds.

2.2.2 Aquatic Macroinvertebrates and Substrate Type

Due to the large size of the Black River, macroinvertebrates were sampled from a boat. A PONAR dredge was used to collect sediment samples at four random locations within the vicinity of the mouth of Stocks Creek and the I-94 overpass. Samples were preserved in alcohol and taken back to the lab for identification of adult macroinvertebrates. An additional 10 sediment samples were taken to characterize substrate types up and downstream of I-94.

Substrate types were generally characterized on site after each sample was taken. Substrate classification was used to identify habitat types present for both fish and macroinvertebrates and to determine if suitable habitat exists for the round hickory nut (See WCR, Technical Memorandum, Threatened and Endangered Species Assessment). Substrates were identified as sand, silt, clay, organics, or a combination of these types.

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3.0 RESULTS

3.1 Stocks Creek

Stations 1 and 2 were sampled on September 24, 2003, at 11:00-11:20 am and 10:30-10:50 am, respectively. Weather conditions were overcast and air temperature was approximately 75° F. Water clarity was moderate and stream flows were at normal base levels.

Biological survey results show Stocks Creek to be a relatively poor quality stream with a poor macroinvertebrate and fish community. However, habitat was rated as good to excellent. Each evaluation category and metric result is detailed below:

3.1.1 Habitat Evaluation

Table 2.1 (**Attachment C-1** of **Appendix C**) identifies the range of habitat ratings used in GLEAS Procedure #51 and **Table 3.1** (**Attachment C-2** of **Appendix C**) summarizes the habitat assessment results for Stations 1 and 2. Station 1 was rated as good and Station 2 as excellent.

While the overall ratings are similar between stations, the amount and type of habitat varied. Station 1 contains more downed woody vegetation (snags) and slightly shallower average water depths. The riparian zone is wide and well vegetated with herbaceous and woody vegetation, including mature trees. Substrate is predominantly sand with several gravel areas. Station 2 is narrower, with a deeper channel and more stable banks covered with herbaceous vegetation. Substrates consist of sand and clay, and undercut banks are common.

The metrics used to rate overall habitat quality can also be used separately to assess habitat at a given sample location. Each metric is briefly discussed below in reference to the sample stations.

Epifaunal Substrate/Available Cover. This metric measures the relative quantity and diversity of natural structures in the stream, such as gravel, large rocks, woody debris, and undercut banks, available as habitat for aquatic organisms. Station 1 received an excellent rating due to a greater presence of substrate favorable for colonization of organisms. Woody debris, hard substrate and undercut banks are common. Station 2 received a rating of good. Undercut banks are prevalent, but the station lacks an abundance of hard substrates and woody vegetation.

Pool Substrate Characterization. This metric evaluates the type and condition of substrate found in pools. Firm substrates and vegetation support a greater diversity of organisms. Station 1 scored higher, again because of a larger amount of gravel and firm sand. Both stations have submergent vegetation present.

Pool Variability. This metric rates the overall variability of pool types according to size and depth. A larger variety of pool types supports a larger diversity of organisms. Both stations have an excellent mix of pool habitats.

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Sediment Deposition. This parameter measures the ratio of stream bottom affected by deposition (sediment, clays, and loose sand) to the total area of the stream bottom. Areas that contain less depositional material are rated higher showing a more stable habitat for biotic organisms. Station 1 received a marginal rating and Station 2 was rated as good. Station 1 has slightly more deposition occurring.

Channel Flow Status. Adequate and stable water is a prime requisite for most aquatic organisms found in streams. Flow stability assesses the regularity, permanence, and stability of flows within the stream. Streams with stable flows and natural water supplies (groundwater dominant) receive higher ratings. Conversely, streams with "flashy", unstable flows receive lower ratings. Station 2 has a more stable stream channel, but both stations exhibit some evidence of periodic high flows during storm events.

Channel Alteration. This is a measure of the large-scale change in stream morphology. Evidence of alteration may include dredging, artificial embankments or straightening. Higher scores are given to stream channels that offer natural habitats to aquatic organisms. It appears that the channel has been altered near both stations to accommodate construction of the roadway. Both stations appear more natural as distance from the roadway increases.

Channel Sinuosity. This metric evaluates the degree of meandering. A large value indicates a higher degree of meandering resulting in habitat for a larger diversity of organisms. Both stations contain linear stream reaches with small meanders and were rated as marginal.

Bank Stability. Bank stability is a measure of bank erosion, based on adjacent side slopes and the potential for extreme, high flow flooding conditions. Higher erosion potential receives lower scores. Station 1 has many areas of considerable erosion and was scored as poor while Station 2 had fewer erosional areas and was rated as marginal.

Bank Vegetative Protection. This parameter is a measure of the density of bank vegetation and other erosion control structures (boulders, rocks, etc.). Streamside vegetation provides increased protection from bank erosion and subsequent sedimentation. Therefore, areas exhibiting higher densities receive higher scores. Both stations were rated as marginal.

Riparian Vegetation Zone Width. This metric measures the width of vegetation along the banks. The riparian zone provides habitat, filters pollutants and sediment, and provides thermal protection to the stream channel. Both stations received excellent rating due to extremely wide riparian areas. Both are vegetated and relatively undisturbed.

3.1.2 Aquatic Macroinvertebrates

Table 3.2 (**Attachment C-3** of **Appendix C**) summarizes the macroinvertebrate sampling results for Stations 1 and 2. Both stations were rated as containing poor macroinvertebrate communities. The metrics used to identify the ratings are briefly discussed below.

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Total Number of Taxa. Taxa richness and species diversity are standard indicators of healthy and stable biological communities. This metric evaluates the total number of taxa found and rates diverse systems higher than monotypic communities. Station 1 had a total of 13 taxa and Station 2 had a total of 11 taxa.

Total Number of Mayfly (Order Ephemeroptera) Taxa. The total number of mayfly taxa is used as an overall indicator of stream quality. Mayflies are, as a group, considered to be intolerant to pollution. Their presence, in abundance is therefore rated high in this metric. Mayfly were absent at both Stations 1 and 2.

Total Number of Caddisfly (Order Trichoptera) Taxa. Like mayflies, caddisflies are pollution intolerant. Areas containing high numbers of caddisflies are given higher metric values. However, several species can tolerate varying degrees of habitat degradation. Caddisflies were not present at either station.

Total Number of Stonefly (Order Plecoptera) Taxa. Stoneflies are the most sensitive to poor water quality and their presence is often an indicator of excellent water quality. No stoneflies were found within the study areas.

Percent Mayfly Composition. This is the ratio of mayflies to the total number of species found. As with the total number of mayfly taxa, the percent composition of mayflies can drastically decline with stream quality degradation. As indicated above, mayfly were absent form the sample stations.

Percent Caddisfly Composition. This is the ratio of caddisflies found in relation to the total number of species found within the sample area. Again, no caddisfly were found at the sample locations.

Percent Contribution of Dominant Taxa. This metric calculates the ratio of the number of dominant taxa found to the total number of organisms collected. The results provide an indication of community structure and balance. Those areas dominated by few species, or composed of several taxa but strongly dominated by one, indicate lower quality systems. Both stations were strongly dominated by one taxa. Station 1 contained a 54.78 percent dominance of scuds and Station 2 had 48.65 percent dominance of scuds.

Percent Isopods (Order Isopoda), Snails (Class Gastropoda), and Leeches (Class Hirudinea). Taxa from these three groups can tolerate to a wide variety and range of environmental conditions. High percent abundance of these animals is a good indicator of degraded stream habitats and low water quality. Both stations contained relatively low percentages of these groups. Station 1 contained 3.31 percent of this group, while Station 2 contained 1.08 percent.

Percent Surface Dependent. Surface dependent taxa refers to invertebrates that obtain oxygen through direct atmospheric exchange, usually at the air/water interface. High abundance of these animals is an indication of diurnal oxygen changes or other biological or chemical oxygen use. These taxa are also found in streams with higher temperatures and low, erratic flows that typically have low or fluctuating dissolved

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oxygen concentrations. Both stations contained a high percent of surface dependent species. Station 1 contained 25.74 percent surface dependent insects and Station 2 contained 34.05 percent.

3.1.3 Fisheries

Table 3.3 (**Attachment C-4** of **Appendix C**) summarizes the fish survey results for Stations 1 and 2. Over 50% of the fish caught at Station 1 and over 40% at Station 2 were central mudminnows (*Umbra limi*), which is considered a tolerant and omnivorous species. Both tolerant and omnivorous fish are typically indicators of poor water quality and habitat conditions. However, the majority of additional species caught at both stations were piscivores or insectivores, which are potential indicators of good water quality and trophic diversity and health. In addition, young-of-the-year (YOY) bluegill (*Lepomis macrochirus*) was found at both stations and one YOY largemouth bass *(Micropterus salmoides)* was found at Station 2. The presence of YOY is indicative of nearby spawning activity and use of the stream for nursery and rearing habitat.

3.2 Black River

The Black River was sampled on July 9, 2004 between 10:00 and 11:30 am. Weather conditions were partly cloudy and air temperature was approximately 75° F. Water clarity was approximately 2 inches of visibility and stream flows were slightly above base flow.

Survey results show the Black River at this location has poor habitat and a poor macroinvertebrate community. The Black River at I-94 has a wide, linear channel that has been dredged in the past. A public boat launch is present immediately upstream of I-94 and the river has been widened immediately downstream, where marinas are present. Riverbanks show signs of erosion and contain large amounts of debris including old boats, broken concrete, and household refuse.

3.2.1 Aquatic Macroinvertebrates, Substrates, and Fisheries

Table 3.4 (**Attachment C-5** of **Appendix C**) summarizes the results of the grab samples for the Black River. Samples were strongly dominated by chironomids, which are tolerant of poor water quality conditions. Larval Physidae (snails) were also found in the sample at Station 4 and one zebra mussel shell was also found at Station 1. The density of chironomids was estimated to be 172/m^2 at Station 1 and 387/m^2 at Station 4. Bottom substrates were dominated by silts, clays, and fine sands. Substrate near the mouth of Stocks Creek, at Station 1, was dominated by coarse sand.

Sampling for fish was not conducted. However, discussions with the MDNR, Fisheries Division, revealed that the Black River receives annual spawning runs of steelhead (*Oncorhynchus mykiss*) and chinook salmon (*Onchorhychus tshawytscha*). Spawning is not known to occur within the project area, but does occur in upstream reaches, where hard, gravel and cobble bottom substrates are present. In addition, a large emergent wetland system is present immediately upstream of the confluence of Stocks Creek that contains potential nursery, spawning, and feeding habitat for a variety of warm and cool water fish species.

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4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Stocks Creek

Habitat assessments associated with Stocks Creek scored as good to excellent, with fish and invertebrate community structures indicative of a lower quality stream. One reason for the degraded biological communities may be a lack of connectivity to higher quality in-stream habitats. Between the sampling stations and the Black River, Stocks Creek has been altered and appears to be highly degraded, perhaps eliminating fish migration between systems. Upstream influences may also be contributing to degraded water quality. More detailed analysis would be required to identify specific reasons for the lack of aquatic macroinvertebrate diversity where relatively good physical habitat is present.

Although fish sampling resulted in catches of tolerant species, sampling was not specifically targeting fish and species indicative of a healthy fish community are present. When considering the habitat present within the sample stations, additional species would be expected to be present that are indicative of higher quality conditions.

The sampling data from both stations show the quality of the stream to be similar both up and downstream of I-94. However, the stations are quite different in nature. Station 1 is located in a forested area and Station 2 is located in a vast floodplain dominated by reed canary grass (*Phalaris arundinacea*).

Based on professional observation of the area, roadwork at this location (if necessary) would likely have a greater long-term impact downstream of I-94 than upstream. Immediately downstream of I-94, the stream and its riparian area are more natural. Stocks Creek immediately upstream of I-94 appears to have been altered more severely than downstream areas. Therefore, the potential to successfully re-establish existing habitats after road construction is higher upstream than downstream.

The Alternative 3 alignment has potential to impact Stocks Creek through road widening and associated culvert extensions. Extension of the culvert and fill for side slopes is expected to result in negative resource impacts to the creek. The extent of the impact is dependent not only on the length of enclosure, but also on the quality of the existing biotic community associated with the watercourse.

Placement of culverts or stream enclosures (CMP for example) results in significant habitat changes, essentially eliminating bottom, bank, and other in-stream habitats. These impacts often result in migration barriers to fish, excluding them from areas of required or preferred habitats. Enclosures also eliminate sunlight penetration, which is necessary for primary production. Loss of primary production results in a reduction in food sources in downstream waters, thereby reducing fish and macroinvertebrate production.

Culverts can also impact habitats upstream and downstream of the inverts. Undersized structures and/or improper alignments can increase flood stage, and increase and redirect flow velocities, causing bed and bank scour and downstream sedimentation. Increased velocities can also injure and displace aquatic organisms.

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Sedimentation from erosion, both during and after construction, can also severely impact aquatic biota by altering preferred habitat. Silt that covers and/or adheres to stone, gravel, and other hard substrates reduces spawning and feeding success of most fish species, and covers habitat critical to many macroinvertebrates.

Based on the results of the Stocks Creek surveys, WCR provides the following opinions and recommendations:

- Alternatives 1 or 2 are recommended since both alternatives avoid work near the Stocks Creek.
- Should road widening at this location be necessary, construction of a clear span bridge is recommended to minimize impact to Stocks Creek.
- Placement of an appropriately sized bottomless culvert should be considered if bridgework is not feasible or prudent. Placement of the culvert should attempt to maintain stream width and existing bottom substrates.
- Placement of an enclosed culvert should be avoided, if possible. Should this alternative be deemed necessary, an over-sized culvert should be buried in the streambed and appropriately sized stone placed to create substrate within the culvert.
- Any construction alternative should include an engineered design to accommodate flood flows and minimize erosion up and downstream of the crossing.
- Any construction alternative should include soil erosion measures to avoid sediment input into the creek and movement of sediment downstream.
- Any construction alternative should include suitable slope design and final stabilization techniques to avoid long-term erosion and sedimentation to Stocks Creek.
- Any construction alternative involving an enclosure should minimize the length of culvert necessary (and associated stream enclosure) to accomplish the project purpose.
- All disturbed streambed and bank areas should be restored using techniques that improve stream habitat.

4.2 Black River

Assessments associated with the Black River show biotic habitat to be poor and an invertebrate community tolerant of poor water quality conditions. The data show the quality of the stream to be similar upstream, downstream, and directly beneath I-94. These results should be expected, since habitat at this location has been degraded by past streambed and bank alterations. The coarse sand at the mouth of Stocks Creek represents the highest quality of substrate sampled, but lies outside of the area of impact.

Alternatives 1, 2, and 3 have the potential to impact the Black River through road widening and construction of additional bridge supports. While existing habitat, water clarity, and macroinvertebrate community structure are poor, placement of bridge supports will, to some degree, result in loss of bottom habitats for the invertebrates and fish that use the area. Chironomids are indicative of poor water quality conditions and

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were the only insects found within the sample areas. However, they are an important food source for many fish species. Bridge construction would result in loss of specific areas for invertebrate production, though overall impacts are expected to be minor.

Sedimentation from erosion, both during and after construction, can also severely impact aquatic biota by altering preferred habitat. Silt can travel downstream and cover higher quality fish and macroinvertebrate habitats. Suspended sediments also reduce the ability of fish and macroinvertebrates to feed and respire.

Based on the results of the Black River surveys, WCR provides the following opinions and recommendations:

- Alternatives 1, 2 and 3 will have some impact to habitat in the Black River, though overall impacts are expected to be minor.
- Any construction alternative should include an engineered design to accommodate flood flows and minimize erosion up and downstream of the bridge.
- Any construction alternative should provide for proper soil erosion measures to avoid sediment input into the river.
- Any construction alternative should include suitable slope design and final stabilization techniques to avoid long-term erosion and sedimentation to the river.
- All disturbed streambed and bank areas should be restored using techniques that improve stream habitat.

The opinions and recommendations provided for both the Black River and Stocks Creek are intended to provide direction to minimize or eliminate long term impacts to water quality and associated aquatic biota. Consideration of these recommendations and employing appropriate best management practices are expected to maintain compliance with MDOT's Phase II Stormwater Permit.

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5.0 LIST OF REFERENCES

Merritt, R. and K Cummins. 1996. Aquatic Insects of North America. Kendall/Hunt Publishing Co., Dubuque, Iowa, 862 pp.

Michigan Department of Environmental Quality (MDEQ), 1997. Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers, GLEAS Procedure Number 51 with 2002 revisions. Michigan Department of Environmental Quality, Surface Water Quality Division, Lansing, Michigan.

Scott, W.B. and E.J. Crossman. 1979. Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada, Ottawa 1973. 966 pp.

WCR, Technical Memorandum, Threatened and Endangered Species Assessment, 2004 Prepared for Wilbur Smith and Associates as part of resource impact assessments for the Blue Water Bridge Plaza Expansion Project. Unpublished.

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    - Mr. Mike Thomas, Fisheries Research Biologist

- Michigan Natural Features Inventory

- Wilbur Smith Associates, Inc.
    - Mr. Doug LaVoie, Associate In-charge
    - Mr. Kirk Haybarker, Regional Vice President
    - Mr. Todd Davis, Manager, Environmental & Transportation Planning Services

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APPENDICES

APPENDIX A

FIGURES

ATTACHMENT A-1

Figure 2.1

Sample Location Map for Stocks Creek

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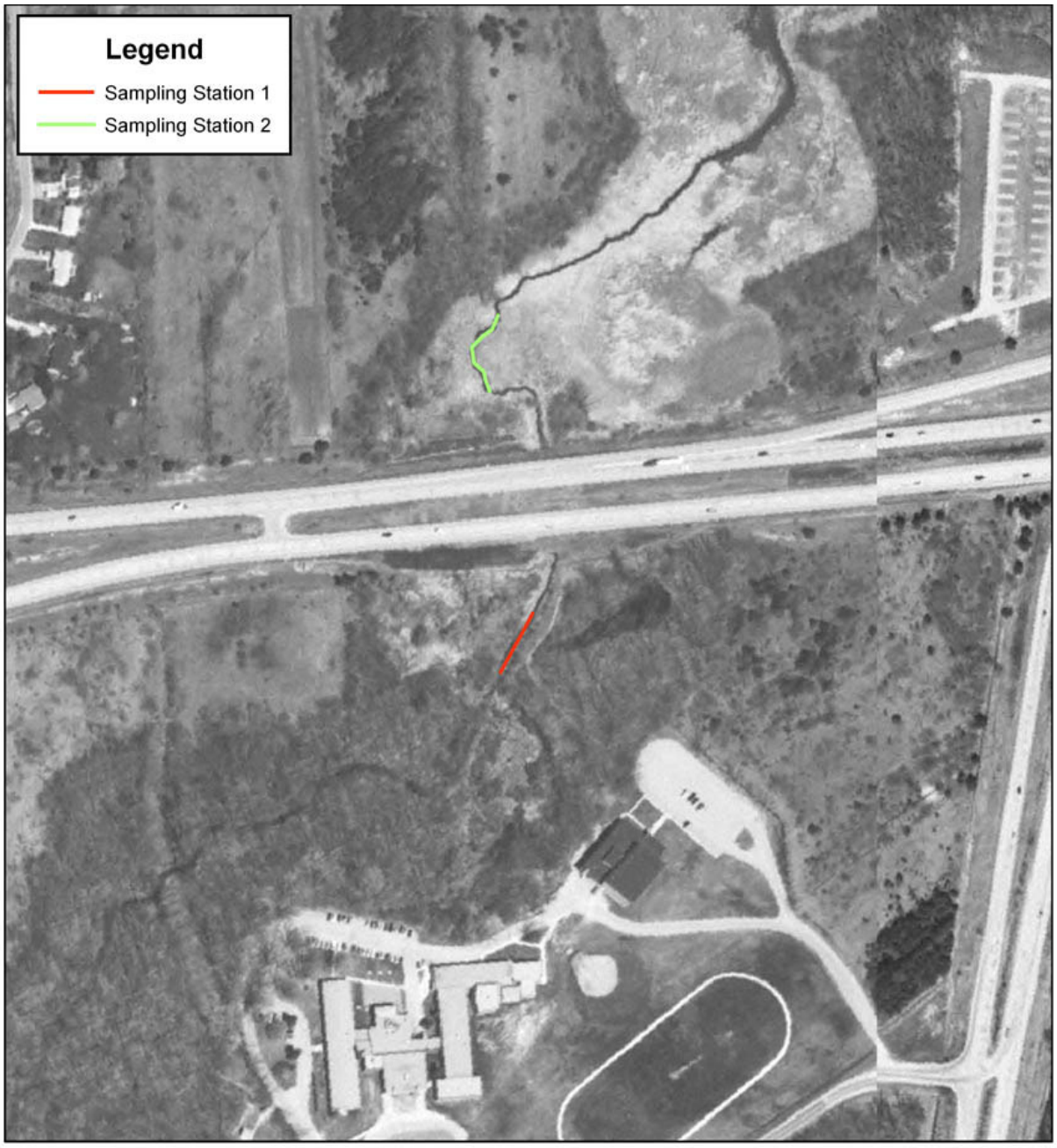

Sample Location Map for Stocks Creek

580 290 0 580 Feet

N

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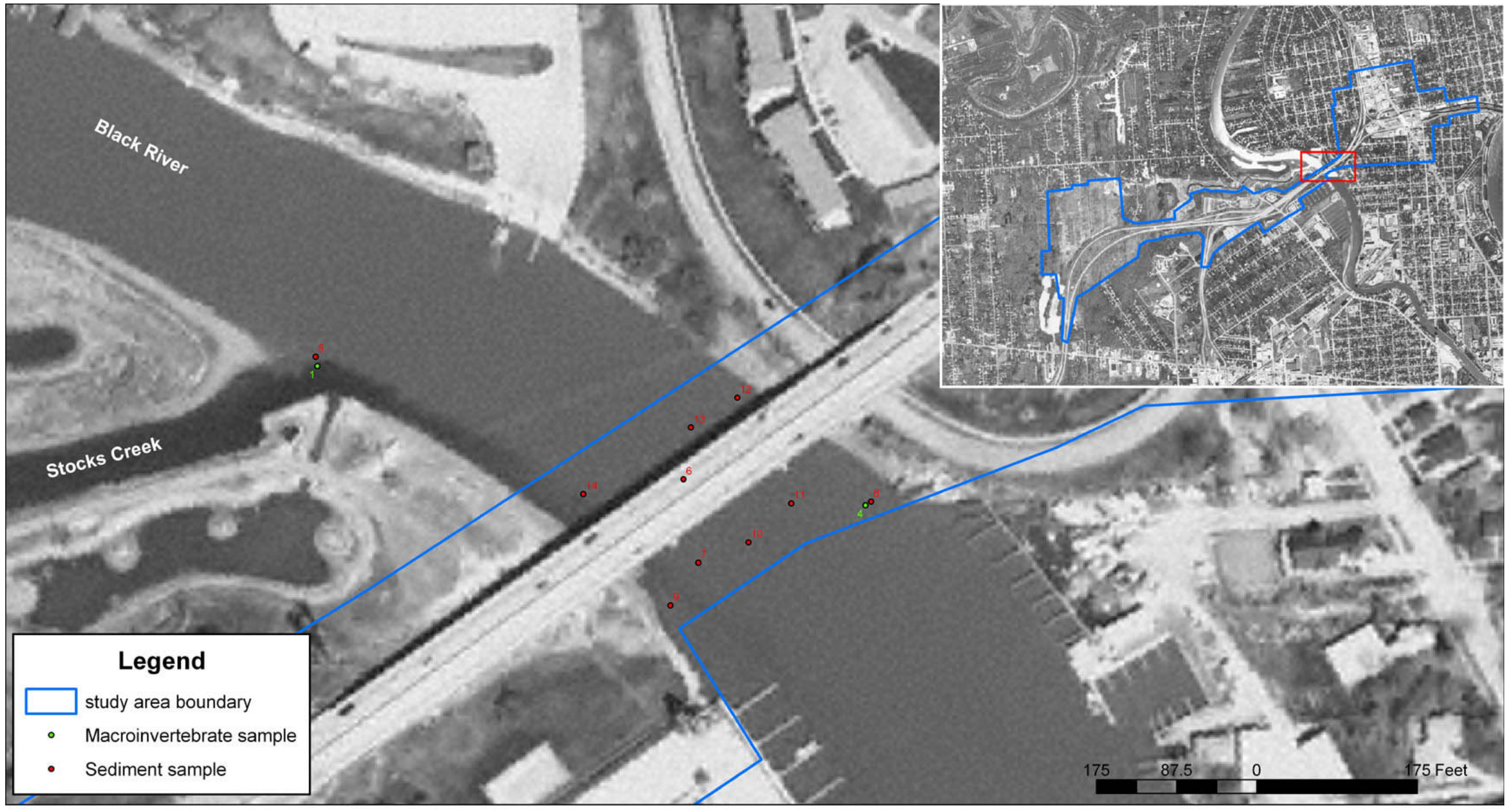
ATTACHMENT A-2

Figure 2.2

Sample Location Map for the Black River



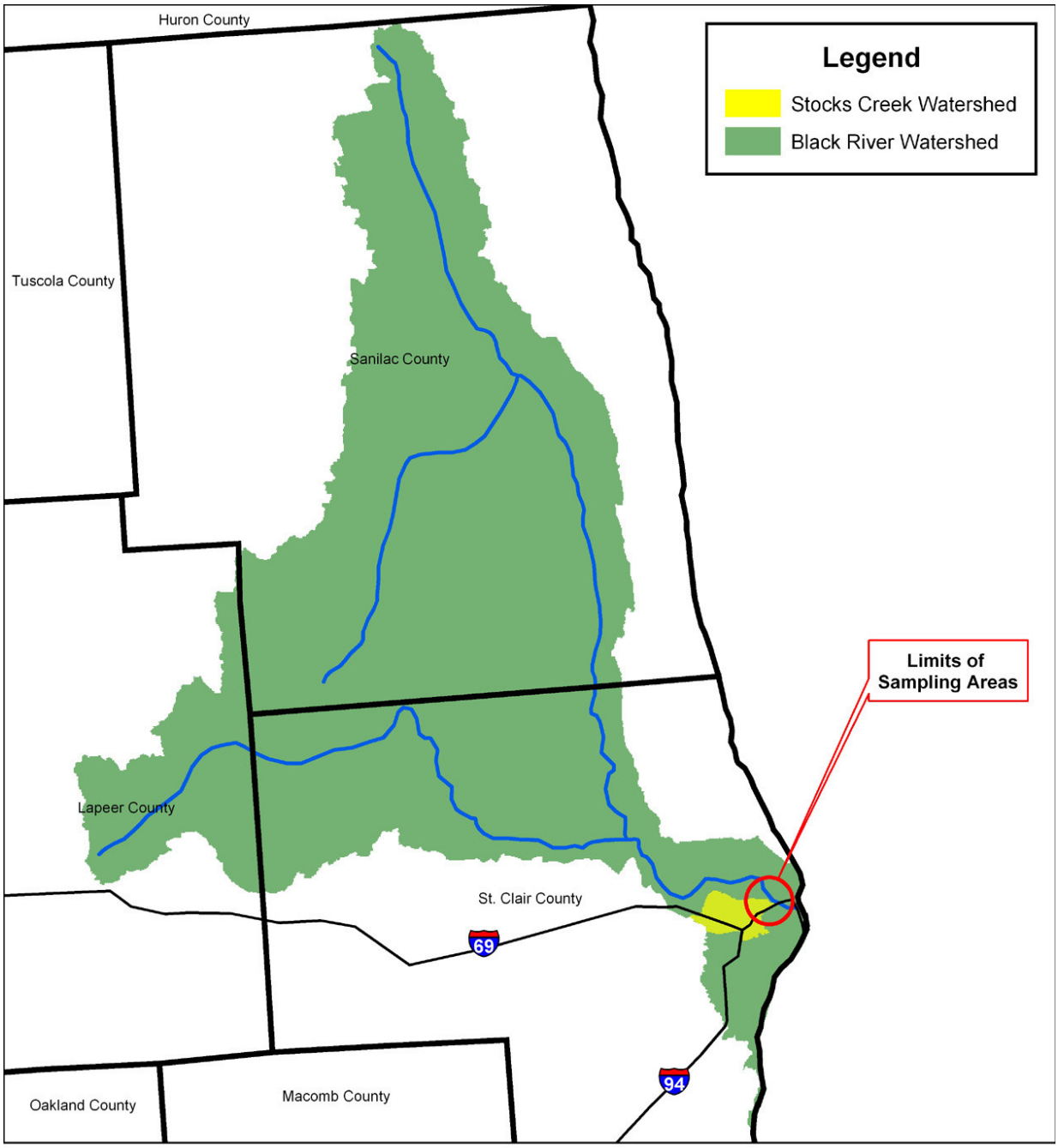
Sample Location Map for the Black River.

Wetland and Coastal Resources, Inc 5801 W. Michigan Ave. Lansing, MI 48917	Wilbur Smith Associates Blue Water Bridge Plaza Study	AJS 03/21/05	FIGURE NO. 2.2

ATTACHMENT A-3

Figure 2.3

Watershed Map for the Black River and Stocks Creek



Watershed Map for the Black River and Stocks Creek

0 5 10 20 Miles

N

Wetland and Coastal Resources, Inc 5801 W. Michigan Ave. Lansing, MI 48917	Wilbur Smith Associates Blue Water Bridge Plaza Study	AJS 02-051 08/11/05	FIGURE NO. 2.3

APPENDIX B

Photographs of Sample Stations for Stocks Creek
and
Photographs of Sample Stations for the Black River


Stocks Creek Station 2


Stocks Creek Station 1

APPENDIX C

TABLES

ATTACHMENT C-1

Table 2.1

GLEAS Procedure # 51 Habitat Rating Tables for Streams

Table 2.1 GLEAS Procedure # 51 Habitat Rating Tables for Streams

METRIC (Riffle/Run)	SCORING RANGE/RATING			
	Excellent	Good	Marginal	Poor
Substrate and Instream Cover				
1. Epifaunal Substrate/Available Cover	16 - 20	11 - 15	6 - 10	0 - 5
2. Embeddedness	16 - 20	11 - 15	6 - 10	0 - 5
3. Velocity/Depth Regime	16 - 20	11 - 15	6 - 10	0 - 5
Channel Morphology				
4. Sediment Deposition	16 - 20	11 - 15	6 - 10	0 - 5
5a. Flow Status – Maintained Flow Volume	9 - 10	6 - 8	3 - 5	0 - 2
5b. Flow Status – Flashiness	9 - 10	6 - 8	3 - 5	0 - 2
6. Channel Alteration	16 - 20	11 - 15	6 - 10	0 - 5
7. Frequency of Riffles (or Bends)	16 - 20	11 - 20	6 - 10	0 - 5
Riparian and Bank Structure				
8. Bank Stability	16 - 20	11 - 15	6 - 10	0 - 5
9. Vegetative Protection	16 - 20	11 - 15	6 - 10	0 - 5
10. Riparian Vegetation Zone Width	16 - 20	11 - 15	6 - 10	0 - 5

METRIC (Glide/Pool)	SCORING RANGE/RATING			
	Excellent	Good	Marginal	Poor
Substrate and Instream Cover				
1. Epifaunal Substrate/Available Cover	16 - 20	11 - 15	6 - 10	0 - 5
2. Pool Substrate Characterization	16 - 20	11 - 15	6 - 10	0 - 5
3. Pool Variability	16 - 20	11 - 15	6 - 10	0 - 5
Channel Morphology				
4. Sediment Deposition	16 - 20	11 - 15	6 - 10	0 - 5
5a. Flow Status – Maintained Flow Volume	9 - 10	6 - 8	3 - 5	0 - 2
5b. Flow Status – Flashiness	9 - 10	6 - 8	3 - 5	0 - 2
6. Channel Alteration	16 - 20	11 - 15	6 - 10	0 - 5
7. Channel Sinuosity	16 - 20	11 - 20	6 - 10	0 - 5
Riparian and Bank Structure				
8. Bank Stability	16 - 20	11 - 15	6 - 10	0 - 5
9. Vegetative Protection	16 - 20	11 - 15	6 - 10	0 - 5
10. Riparian Vegetation Zone Width	16 - 20	11 - 15	6 - 10	0 - 5

Habitat Characterization	Total Point Score (metrics 1-10)
1. Excellent	>154
2. Good	105 – 154
3. Marginal	56 – 104
4. Poor	<56

Table from MDEQ 2002

ATTACHMENT C-2

Table 3.1

Habitat Evaluations for Stocks Creek.

Table 3.1 Habitat Evaluation for Stocks Creek

Habitat evaluation for **Stock Creek**	Station 1	Station 2
HABITAT METRIC		
Substrate and Instream Cover		
Epifaunal Substrate/ Avail Cover	17	13
Pool Substrate Characterization	16	14
Pool Variability	16	18
Channel Morphology		
Sediment Deposition	10	14
Flow Status - Maint. Flow Volume	9	9
Flow Status - Flashiness	4	7
Channel Alteration	13	14
Channel Sinuosity	9	9
Riparian and Bank Structure		
Bank Stability (L)	4	9
Bank Stability (R)	5	9
Vegetative Protection (L)	9	8
Vegetative Protection (R)	9	8
Riparian Veg. Zone Width (L)	16	16
Riparian Veg. Zone Width (R)	16	16
TOTAL SCORE (200):	153	160
HABITAT RATING:	GOOD	EXCELLENT
	(SLIGHTLY	(NON-
	IMPAIRED)	IMPAIRED)
Date:	June 16, 2004	June 16, 2004
Weather:	overcast	overcast
Air Temperature (deg F):	75	75
Water Temperature (deg F):	65	65
Ave. Stream Width (ft):	9	7
Ave. Stream Depth (ft):	1.5	2
Surface Velocity (ft/s):	2.5	2.5
Estimated Flow (cfs):	33.75	35
Stream Modifications:	past dredging	past dredging
Nuisance Plants (Y/N):	N	N

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

ATTACHMENT C-3

Table 3.2

Qualitative Macroinvertebrate Sampling Results for Stocks Creek.

Table 3.2 Qualitative Macroinvertebrate Sampling Results for Stocks Creek

Taxa	Station 1		Station 2	
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1			
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	149		90	
Decapoda (crayfish)	3		1	
Isopoda (sowbugs)	1		1	
Insecta				
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	34		25	
Zygoptera (damselflies)				
Calopterygidae	7		3	
Hemiptera (true bugs)				
Belostomatidae	2		4	
Corixidae	21			
Gerridae	11		43	
Nepidae	1			
Notonectidae	1			
Coleoptera (beetles)				
Dytiscidae (total)			1	
Gyrinidae (adults)	34		15	
Diptera (flies)				
Tipulidae			1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)				
Physidae	7		1	
TOTAL INDIVIDUALS	272		185	
METRIC	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	13	0	11	-1
NUMBER OF MAYFLY TAXA	0	-1	0	-1
NUMBER OF CADDISFLY TAXA	0	-1	0	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	0.00	-1
PERCENT CADDISFLY COMP.	0.00	-1	0.00	-1
PERCENT CONTR. DOM. TAXON	54.78	-1	48.65	-1
PERCENT ISOPOD, SNAIL, LEECH	3.31	1	1.08	1
PERCENT SURF. AIR BREATHERS	25.74	-1	34.05	-1
TOTAL SCORE		-6		-7
MACROINV. COMMUNITY RATING	POOR		POOR	

ATTACHMENT C-4

Table 3.3

Qualitative Fish Sampling Results for Stocks Creek.

Table 3.3 Qualitative Fish Sampling Results for Stocks Creek.

Station 1		
Common Name	Scientific Name	Number Caught
bluegill	*Lepomis macrochirus*	2
brook stickleback	*Culeae inconstans*	1
central mudminnow	*Umbra limi*	5
pumpkinseed	*Lepomis gibbosus*	1

Station 2		
Common Name	Scientific Name	Number Caught
central mudminnow	*Umbra limi*	4
bluegill	*Lepomis macrochirus*	2
johnny darter	*Etheostoma nigrum*	2
largemouth bass	*Micropterus salmoides*	1

ATTACHMENT C-5

Table 3.4

Qualitative Macroinvertebrate and Substrate Sampling Results for the Black River

Table 3.4 Qualitative Macroinvertebrate and Substrate Sampling Results for the Black River

Station 1		
Scientific Name	Number Caught	Organisms/(M²)
Chironomid	4	172
Dreissena polymorpha	1	43

Station 4		
Scientific Name	Number Caught	Organisms/(M²)
Chironomid	9	387
Physidae	4	172